UNITED STATES PATENT AND TRADEMARK OFFICE

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10/634,874	08/06/2003	Babak Habibi	170154.401C1	7619

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SEED INTELLECTUAL PROPERTY LAW GROUP PLLC
701 FIFTH AVE
SUITE 5400
SEATTLE, WA 98104

EXAMINER
MARC, MCDIEUNEL

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3664	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

	Application No.	Applicant(s)
Office Action Summary	10/634,874	HABIBI ET AL.
	Examiner	Art Unit	
	MCDIEUNEL MARC	3664	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>25 November 2009</u>.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>33-47 and 49-61</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>33-38, 40-47 and 49-61</u> is/are rejected.

7)☒ Claim(s) <u>39</u> is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>05 June 2009</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date <u>11/25/2009</u>.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____ .

DETAILED ACTION

1.   Claims 33-47 and 49-61 are pending.

2.   Applicant's arguments, see regarding a single camera performing the calibration, filed

11/25/2009, with respect to the rejection(s) of claim(s) 33-47 and 49-61 under under 35

U.S.C. 102(b) as being anticipated by Wei et al. (*Multisensory Visual servoing by a Neural*

Network, 1999) have been fully considered and are persuasive. Therefore, the rejection has been

withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view

Claim Rejections - 35 USC § 103

3.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

4.   This application currently names joint inventors. In considering patentability of the

claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various

claims was commonly owned at the time any inventions covered therein were made absent any

evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out

the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c)

and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5.   Claims 33-38, 40-47 and 49-61 are rejected under 35 U.S.C. 103(a) as being unpatentable

over McGee et al. (US 4942539 A) in view of Wei et al. (*Multisensory Visual servoing by a*

Neural Network, 1999).

As per claim 33, McGee et al. teaches a single camera for automatically determining the

position and orientation of an object by utilizing as few as a single digital image generated by as

few as a single camera without the use of a structured light. The digital image contains at least

three non-colinear geometric features of the object that equates to the single camera of this

application (see abs. and fig. 1, particularly the single camera and "a programmed computer

together with reference data and camera calibration data to provide at least three non-parallel 3-D

lines. The 3-D lines are utilized by an iterative algorithm to obtain data relating to the position

and orientation of the object in 3-D space."). McGee et al. does not specifically teach the

following limitations as taught by the secondary reference Wei et al.

Wei et al., in the other hand teaches a multisensory visual servoing by a neural network,

including a capturing a number of images of a calibration object (see fig. 4) by the camera

(see page 279, col. 2, lines 1-7, and fig. 4, wherein evidence has shown about two camera instead

of one); determining a set of (*intrinsic parameters*)[1] (see page 276, col. 2, section II., and col. 1,

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[1] **Intrinsic parameters** = The intrinsic matrix containing 5 intrinsic parameters. These parameters encompass focal length, image format, and principal point. The parameters $\alpha_x = f \cdot m_x$ and $\alpha_y = f \cdot m_y$ represent focal length in terms of pixels, where m_x and m_y are the scale factors relating pixels to distance. Nonlinear intrinsic parameters such as lens distortion are also important

second paragraph, wherein both intrinsic and extrinsic parameters have been covered by

"sensor/camera calibration", and fig. 2 for motion parameters) of the camera (see figs. 2-3) from

at least one of the number of images of the calibration object (see page 276, col. 1, third

paragraph, lines and 1-8, and page 279, col. 2, lines 12-13) captured by the camera (as seen in

fig. 3 below); and determining a set of extrinsic parameters (see page 1, col. 1, second paragraph,

wherein both intrinsic and extrinsic parameters have been covered) of the camera (see figs. 2-3)

from at least one of the number of images of the calibration object captured by the camera (see

fig. 4, wherein the clearer picture has been considered as calibrated), the set of extrinsic

parameters (see page 1, col. 1, second paragraph, wherein both intrinsic and extrinsic parameters

have been covered as noted above) comprising a camera (see figs. 2-3, wherein any one of the

cameras performs the required function, and having more than one falls under design choice)

space-to-training space transformation defining a transformation between a space reference

frame and a training space reference frame (see page 2, particularly "space-to-training space

transformation" has been interpreted as from object to the camera/range finders, to the training

and to the geometric transformation, "a space reference frame" has been interpreted as from the

reference position to the algorithm module to the camera/range finders, to the shift and finally to

the geometric transformation and col. 1, wherein reference frame has been considered as position

frame).

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although they cannot be included in the linear camera model described by the intrinsic parameter matrix. Many modern camera calibration algorithms estimate these intrinsic parameters as well.
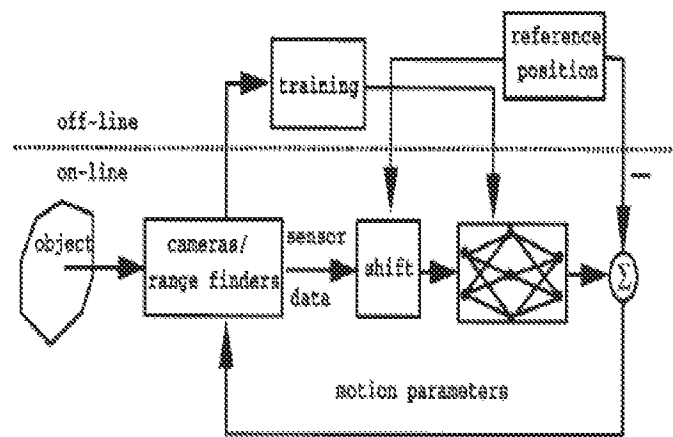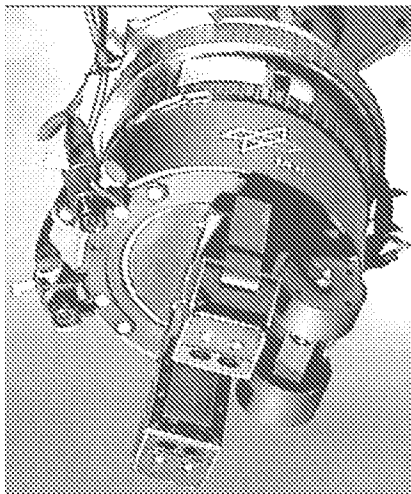
As per claim 34, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a positioning the camera (see figs. 2-3) with respect to the calibration object (see page 276, second paragraph lines 1-5 and col. 2, section II., particularly "Here uniqueness means that the sensory data should be able to uniquely determine the end-effector's relative position with respect to the object, while redundancy requires that one use more than the minimum number of sensory data to achieve robustness in the pose determination.").

As per claim 35, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method wherein positioning the camera (see figs. 2-3) with respect to the calibration object (see abs. and fig. 4) comprises positioning the camera orthogonally (see fig. 3, wherein the camera has been considered mounted orthogonally) with respect to a ruled template with a number of features (see page 5, table II, which has been considered as template), where a known or determinable physical relationship exists between at least some of the features (see page 277, cols. 1-2, particularly table I, wherein roll, pitch and yaw have been considered as physical features).

As per claim 36, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method wherein positioning the camera (see figs. 2-3) with respect to the calibration object (see abs. and fig. 4) comprises positioning the camera (see figs. 2-3, wherein the camera being position to see/track an object on a conveyor) with respect to a sample of a type of object the robot will manipulate (see fig. 2, particularly the object and page 276, section I. lines 1-5), the sample having a number of features, where a known or determinable physical relationship exists between at least some of the features (see page 277, cols. 1-2, particularly table I, wherein roll, pitch and yaw have been considered as physical features).

As per claim 37, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method wherein capturing a number of images of a calibration object (see abs. and fig. 4) by the camera comprises capturing at least one image at each of a plurality of positions spaced perpendicularly from the calibration object (see page 276 col. 1, third paragraph, particularly "used an eye-on-hand configuration to track an object on a conveyor." being on the conveyor brings a plurality of positions even perpendicular position).

As per claim 38, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method wherein capturing a number of images of a calibration object by the camera (see figs. 2-3) comprises capturing at least one image at each of a plurality of different orientations with respect to the calibration object (see page 276 col. 1, third paragraph, particularly "used an eye-on-hand configuration to track an object on a conveyor." being on the conveyor brings a plurality of positions even different orientations).

As per claim 40, **Wei et al.**, teaches a multisensory visual servoing by a neural network,

including a method wherein determining a set of extrinsic parameters (see page 276, col. 2,

section II., and col. 1, second paragraph, wherein both intrinsic and extrinsic parameters have

been covered by "sensor/camera calibration", and fig. 2 for motion parameters) of the camera

(see figs. 2-3 as noted above) from at least one of the number of images of the calibration object

(see fig. 4) captured by the camera, the set of extrinsic parameters (see page 276, col. I1, section

II., and col. 1, second paragraph, wherein both intrinsic and extrinsic parameters have been

covered by "sensor/camera calibration", and fig. 2 for motion parameters) comprising a camera

(see figs. 2-3) space-to-training space transformation defining a transformation between a camera

space reference frame and a training space reference frame (see page 2, particularly "space-to-

training space transformation" has been interpreted as from object to the camera/range finders, to

the training and to the geometric transformation, "a space reference frame" has been interpreted

as from the reference position to the algorithm module to the camera/range finders, to the shift

and finally to the geometric transformation and col. 1, wherein reference frame has been

considered as position frame) comprises determining a respective translation component along

three orthogonal axes, and a respective rotation component about the three orthogonal axes (see

fig. 2, wherein the axes the box between the shift and ⊗, has been considered as orthogonal

axes).

As per claim 41, **Wei et al.**, teaches a multisensory visual servoing by a neural network

including a method that further comprising determining a camera space-to-tool space

transformation based (see page 276, col. 1, particularly "tracking an object on a conveyor" has

automatically determine camera space-to-tool and page 277, section *B. Dealing with the*

Inexactness of the Mapping has dealt with the transformation) at least in part on at least two of

the number of images captured by the camera of the calibration object (see fig. 4, has been

broadly interpreted as the two images of the calibration).

As per claim 42, **Wei et al.**, teaches a multisensory visual servoing by a neural network,

including a method that further comprising: determining a camera space-to-tool space

transformation based (see page 276, col. 1, particularly "tracking an object on a conveyor" has

automatically determine camera space-to-tool and page 277, section *B. Dealing with the*

Inexactness of the Mapping has dealt with the transformation) on single one of the number of

images captured by the camera of the calibration object (see fig. 3 as noted above) and on a

number of physical coordinates of at least one feature of the calibration object (see page 277,

cols. 1-2, particularly table I, wherein roll, pitch and yaw have been considered as physical

features).

As per claim 43, **Wei et al.**, teaches a multisensory visual servoing by a neural network,

including a method that further comprising: capturing an image of a teaching object (see fig. 2,

wherein the object has been considered as a teaching one) of a type of object that will be

manipulated by the robot (see abs. and fig. 3); selecting a number of features from the captured

image of the teaching object (see abs., and fig. 4); determining a set of object space coordinates

for each of the selected features from the captured image of the teaching object (see fig. 4).

As per claim 44, **Wei et al.**, teaches a multisensory visual servoing by a neural network,

including a method wherein selecting a number of features (see page 2, col. 1) from the captured

image of the teaching object (see fig. 4, and the object on the conveyor as noted above being

teaching object to be captured) comprises selecting six features from the captured image of the

teaching object (see page 280, particularly table II, has been considered having a plurality of selectable image position).

As per claim 45, **Wei et al.**, teaches a multisensory visual servoing by a neural network including a method that further comprising determining an object space-to-camera space transformation defining a transformation between an object space reference frame and the camera space reference frame (see page 2, particularly "space-to-training space transformation" has been interpreted as from object to the camera/range finders, to the training and to the geometric transformation, "a space reference frame" has been interpreted as from the reference position to the algorithm module to the camera/range finders, to the shift and finally to the geometric transformation and col. 1, wherein reference frame has been considered as position frame).
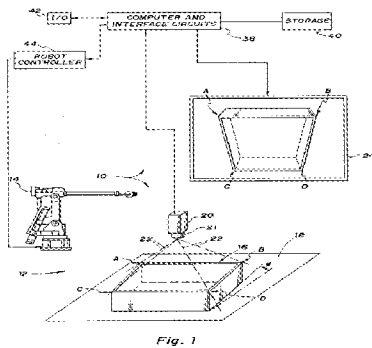
As per claim 46, **Wei et al.**, teaches a multisensory visual servoing by a neural network including a method that comprising determining a position and an orientation of an object frame in the tool frame reference frame (see page 276, col. 1, wherein reference frame has been considered as position frame and table II. for position and orientation) based at least in part on the object frame-to-camera space and camera space-to-tool space transformations (see abstract, pages 1-2 and fig. 2).

As per claim 47, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method that further comprising: providing the position and orientation of the object (see fig. 4) frame to the robot; and training an intended operation path inside the object frame (see page 276 col. 1, third paragraph, particularly "used an eye-on-hand configuration to track an

object on a conveyor." being on the conveyor brings a plurality of positions even different

orientations).

As per claim 49, **Wei et al.**, teaches a multisensory visual servoing by a neural network,

including a method that further comprising: adjusting a position of the movable portion of the

robot if the number of features located in the captured image of the target object is determined to

be an insufficient number of features (see page 276, col. 1, particularly the abs. for calibration);

and capturing another two-dimensional image of the volume containing the target object (see fig.

2-4, wherein image taken by the camera being considered has having the capacity to do two- or

three-dimensional images) before determining the object space-to-camera space transformation

for the target object (see figs. 2 and 3 as noted above).

As per claim 50, McGee et al. teaches a single camera for automatically determining the

position and orientation of an object by utilizing as few as a single digital image generated by as

few as a single camera without the use of a structured light. The digital image contains at least

three non-colinear geometric features of the object that equates to the single camera of this

application (see abs. and fig. 1 as see below, particularly the single camera and "a programmed

computer together with reference data and camera calibration data to provide at least three non-

parallel 3-D lines. The 3-D lines are utilized by an iterative algorithm to obtain data relating to

the position and orientation of the object in 3-D space."). McGee et al. does not specifically

teach the following limitations as taught by the secondary reference Wei et al.

Fig. 1

Wei et al., in the other hand teaches a multisensory visual

servoing by a neural network, including capturing a two-dimensional image of a volume

containing a target object (see fig. 4, wherein the camera being considered for 2D or 3D images);

locating a number of features in the captured image of the target object (see page 276 and col. 1,

as noted above); and determining an object space-to-camera space transformation for the target

object (see fig. 4, wherein automatically the camera determines the target) based at least in part

on a position of at least some of the located features using only the captured image and an

algorithm (see page 276, col. 1 and page 279, col. 2, first paragraph, wherein the user of neural

network avoids computations) that employs a known or determinable physical relationship

between at least some of the located features (see page 277, cols. 1-2, particularly table I,

wherein roll, pitch and yaw have been considered as physical features).

As per claim 51, **Wei et al.**, teaches a multisensory visual servoing by a neural network

including a method that further comprising determining a camera space-to-tool space

transformation based (see page 276, col. 1, particularly "tracking an object on a conveyor" has

automatically determine camera space-to-tool and page 277, section *B. Dealing with the*

Inexactness of the Mapping has dealt with the transformation) at least in part on at least two of

the number of images captured by the camera of the calibration object (see fig. 4, has been

broadly interpreted as the two images of the calibration).

As per claim 52, **Wei et al.**, teaches a multisensory visual servoing by a neural network,

including a method that comprising: determining a position of the object (see fig. 4 and table II)

frame in the tool space reference frame (see page 2, col. 1, wherein reference frame has been

considered as position frame); and providing an object frame to the robot (see fig. 3-4).

As per claim 53, McGee et al. teaches a single camera for automatically determining the

position and orientation of an object by utilizing as few as a single digital image generated by as

few as a single camera without the use of a structured light. The digital image contains at least

three non-colinear geometric features of the object that equates to the single camera of this

application (see abs. and fig. 1, particularly the single camera and "a programmed computer

together with reference data and camera calibration data to provide at least three non-parallel 3-D

lines. The 3-D lines are utilized by an iterative algorithm to obtain data relating to the position

and orientation of the object in 3-D space."). McGee et al. does not specifically teach the

following limitations as taught by the secondary reference Wei et al.

Wei et al., in the other hand teaches a multisensory visual servoing by a neural network

including a system that useful in robotics the apparatus comprising capture at a number of

images of a calibration object (see abs. and fig. 4) means for calibrating the camera, by:

determining a set of intrinsic parameters (page 276, col. 2, section II., and col. 1, second

paragraph, wherein both intrinsic and extrinsic parameters have been covered by "sensor/camera

calibration", and fig. 2 for motion parameters) of the camera from at least one of the number of

images of the calibration object captured by the camera (see abs. and figs. 2-3 as noted above);

and determining a set of extrinsic parameters (see page 276, col. 1, second paragraph, wherein both intrinsic and extrinsic parameters have been covered) of the camera from at least one of the number of images of the calibration object (see page 276 as noted above) captured by the camera, the set of extrinsic parameters (see page 276, col. 2, section II., and col. 1, second paragraph, wherein both intrinsic and extrinsic parameters have been covered by "sensor/camera calibration", and fig. 2 for motion parameters) comprising a camera space-to-training space transformation defining a transformation between a camera space reference frame and a training space reference frame (see page 2, particularly "space-to-training space transformation" has been interpreted as from object to the camera/range finders, to the training and to the geometric transformation, "a space reference frame" has been interpreted as from the reference position to the algorithm module to the camera/range finders, to the shift and finally to the geometric transformation and col. 1, wherein reference frame has been considered as position frame); and means for estimating a pose of a target object (see page 276, section 2., wherein pose determination has been considered for estimation of the pose), by capturing a two-dimensional image of a volume containing a target object (see fig. 2-4, wherein image taken by the camera being considered has having the capacity to do two- or three-dimensional images); and locating at least six features in the captured image of the target object (see page 280, particularly table II, has been considered having a plurality of selectable image position); and determining an object space-to-camera space transformation based on at least in part on a position of at least some of the located features in solely the captured image using an algorithm that employs a known or determinable physical relationship between at least some of the located features (see page 277,

cols. 1-2, particularly table I, wherein roll, pitch and yaw have been considered as physical

features and second *B. Dealing with the Inexactness of the Mapping*).

As per claim 54, **Wei et al.**, teaches a multisensory visual servoing by a neural network,

including a system that comprising: means for training, comprising:

capturing an image of a teaching object (see fig. 4) of a type of object (see fig. 4) that will be

manipulated by the robot; selecting a number of features (see page 2, col. 1) from the captured

image of the teaching object (see fig. 4); determining a set of object (see fig. 4) space coordinates

for each of the selected features (see page 2, col. 1) from the captured image of the teaching

object (see fig. 4); an determining an object (see fig. 4) space-to-camera (see figs. 2-3) space

transformation defining a transformation between an object (see fig. 4) space reference frame

(see page 2, col. 1, wherein reference frame has been considered as position frame) and the

camera (see figs. 2-3) space reference frame (see page 2, col. 1, wherein reference frame has

been considered as position frame).

As per claim 55, **Wei et al.**, teaches a multisensory visual servoing by a neural network,

including a system wherein the means for calibrating, the means for estimating a pose, and the

means for training comprises at least one programmed computer (see abstract, page 1, col. 1 and

page 4, col. 2, second paragraph).

As per claim 56, **Wei et al.**, teaches a multisensory visual servoing by a neural network,

including a system wherein the means for calibrating, the means for estimating a pose, and the

means for training comprises at least one computer-readable medium (see abstract, page 1, col. 1

and page 4, col. 2, second paragraph) storing instructions operating at least one computer (see

abstract, page 1, col. 1 and page 4, col. 2, second paragraph).

As per claim 57, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a system wherein the pose estimating means estimates the pose of the target object (see fig. 4) further by: adjusting a position of the movable portion of the robot (see fig. 3) if the number of features (see page 2, col. 1) located in the captured image of the target object (see fig. 4) is determined to be an insufficient number of features (see page 2, col. 1).

As per claim 58, McGee et al. teaches a single camera for automatically determining the position and orientation of an object by utilizing as few as a single digital image generated by as few as a single camera without the use of a structured light. The digital image contains at least three non-colinear geometric features of the object that equates to the single camera of this application (see abs. and fig. 1, particularly the single camera and "a programmed computer together with reference data and camera calibration data to provide at least three non-parallel 3-D lines. The 3-D lines are utilized by an iterative algorithm to obtain data relating to the position and orientation of the object in 3-D space."). McGee et al. does not specifically teach the following limitations as taught by the secondary reference Wei et al.

Wei et al., in the other hand teaches a multisensory visual servoing by a neural network, including a system that useful in robotics, the apparatus that capture a number of images of a calibration object means for calibrating the camera, by: determining a set of intrinsic parameters (see page 276 and footnote as noted above) of the camera from at least one of the number of images of the calibration object captured by the camera (see figs. 2-4 as noted above); and determining a set of extrinsic parameters (see page 276 as noted above) of the camera from at least one of the number of images of the calibration object captured by the camera (see abstract and fig. 4 as noted above), the set of extrinsic parameters (see page 276 as noted above)

comprising a camera space-to-training space transformation defining a transformation between a

camera space reference frame and a training space reference frame (see page 2, particularly

"space-to-training space transformation" has been interpreted as from object to the camera/range

finders, to the training and to the geometric transformation, "a space reference frame" has been

interpreted as from the reference position to the algorithm module to the camera/range finders, to

the shift and finally to the geometric transformation and col. 1, wherein reference frame has been

considered as position frame); and means for estimating a pose of a target object (seepage 276,

col. 2, section II., wherein pose determination has been taken as estimation of a pose), by

capturing a two-dimensional image of a volume containing a target object (see fig. 4); locating at

least five features in the captured image of the target object (see table II as noted above); and

determining an object space-to-camera space transformation based at least in part on a position

of at least some of the located features using the captured image without any additional captured

images and an algorithm (see page 276, col. 1 and page 279, col. 2, first paragraph, wherein the

user of neural network avoids computations) that employs a known or determinable physical

relationship between at least some of the located features (see page 277, cols. 1-2, particularly

table I, wherein roll, pitch and yaw have been considered as physical features and second *B.*

Dealing with the Inexactness of the Mapping).

It would have been obvious to a person of ordinary skill in the art at the time the

invention was made to modify the robot type of McGee et al., with the robot type of Wei et al.,

because this modification would have a single camera for performing the calibration into Wei's

et al., thereby improving the efficiency and the reliability of the single camera of the single

image 3D vision guided robotics.

As per claim 59, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a system wherein the means for calibrating and the means for estimating a pose comprises at least one programmed computer (see abstract, page 276, col. 2, section II., wherein pose determination has been taken as estimation of a pose and page 279, col. 2, second paragraph, particularly "If we use analytic computer vision methods to solve the same problem, a lot of calibrations have to be involved").

As per claim 60, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a system wherein the means for calibrating and the means for estimating a pose comprises at least one computer-readable medium (see abstract, page 276, col. 1 and page 279, col. 2, second paragraph) storing instructions operating at least one computer (see abstract, page 276, col. 1, wherein "traditional computer" inherently works with computer-readable medium, and page 4, col. 2, second paragraph).

As per claim 53, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a system wherein the pose estimating means estimates the pose of the target object (see fig. 4) further by: adjusting a position of the movable portion of the robot (see fig. 3) if the number of features (see page 2, col. 1) located in the captured image of the target object (see fig. 4) is determined to be an insufficient number of features (see page 2, col. 1).

Allowable Subject Matter

6.   Claim 39 and is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7.   The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record fail to teach determining at least one of a focal length, a first order radial lens distortion coefficient, a set of coordinates of a center of a radial lens distortion, or a scale factor indicative of a framegrabber scanline resampling uncertainty.

8.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to MCDIEUNEL MARC whose telephone number is (571)272-6964. The examiner can normally be reached on 6:30-5:00 Mon-Thu.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Khoi Tran can be reached on (571) 272-6919. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/McDieunel Marc/
Examiner, Art Unit 3664
/KHOI TRAN/
Supervisory Patent Examiner, Art Unit 3664